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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,152	11/26/2003	Chih-Chao Yang	YOR920030506US1 (17077)	9245
23389	7590	09/20/2005	EXAMINER	
SCULLY SCOTT MURPHY & PRESSER, PC 400 GARDEN CITY PLAZA SUITE 300 GARDEN CITY, NY 11530			RICHARDS, N DREW	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 09/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/723,152

Applicant(s)

YANG ET AL.

Examiner

N. Drew Richards

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 July 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 7-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 August 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Species Ia, claims 1-6, in the reply filed on 7/8/05 is acknowledged.

Drawings

2. Figure 4B, 5B and 9A should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 400, as mentioned in paragraph 0005. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of

an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 53, 54 and 57. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

5. Claim 1 is objected to because of the following informalities: line 1 should read "comprising a first level" and line 2 should read "a second level". Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 lines 7-8 recite "to enhance mechanical strength of said semiconductor interconnect structure. This limitation is indefinite as the term "to enhance" is a relative term. In a final structure, one cannot ascertain the meets and bounds of the limitation since the claim provides no comparative basis for what level of mechanical strength is required to be considered "enhanced".

Based on their dependency claims 2-6 include all the limitations of claim 1 and are also indefinite since they do not remedy the indefiniteness of claim 1.

Claim 2 is further indefinite since it recites "exhibits increased resistance to electromigration" and "increasing performance." Both of these limitations are relative. In a final structure, one cannot ascertain the meets and bounds of the limitation since the claim provides no comparative basis for what level of resistance to electromigration is required to be considered "increased" or what level of performance and in what type of performance is required to be considered "increased."

Claim 3 is further indefinite since it recites "exhibiting improved electromigration resistance." This limitation is indefinite for the same reasons given with regard to claim 2 above.

Claim 4 is indefinite since it recites "low-K dielectric." This is a relative term. The meets and bounds of "low-K" are not clearly defined in the claim or specification so as to clearly convey to one of ordinary skill in the art what dielectric constant (K value) is required to be considered "low."

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1-6 are rejected under 35 U.S.C. 102(b) as being anticipated by Wang et al. (U.S. Patent No. 6,383,920 B1).

Wang et al. disclose in figure 2H, for example, a semiconductor interconnect structure 200 comprising first level of metal conductor 206 and second level of metal conductor 222 and one level of insulator material 208/210 formed there between, the structure further comprising a dielectric metal contact via 216 formed at the insulator material level for electrically connecting the first metal and second metal conductors, wherein the metal contact via includes metal liner material 218 surrounding the metal contact via, a portion of the metal liner extending partially into an adjacent metal level of the first and second metal levels (liner 218 extends partially into the second level of metal conductor), in interlocking relation therewith to enhance mechanical strength of the semiconductor interconnect structure (the structure shown is considered to

"enhance" the mechanical strength of the interconnect structure as it provides more surface area for the upper metal to contact).

With regard to claim 2, the adjacent metal level of the first and second metal levels interlocking with the extended portion of the metal liner exhibit increased resistance to electromigration, thereby increasing performance.

With regard to claim 3, the interconnect structure exhibits improved electromigration resistance. The structure forming a back-end-of-line interconnect is merely a product by process limitation that does not structurally distinguish over the prior art.

With regard to claim 4, the one level of insulator material 208 is disclosed as being a low-K material.

With regard to claim 5, the language of this claim does not positively recite that the multiple levels of metal are levels other than the first and second levels of claim 1 or that the insulator material, via, and metal liner are additional structures other than those of claim 1. This claim merely further adds that a level of insulator (with the associated via and metal liner) is formed between each level of metal. In the case of Wang et al., since only two metal levels are shown, Wang et al anticipates this claim since each metal level of Wang is separated by the claimed insulator material, via, and metal liner.

With regard to claim 6, each metal contact via formed at each insulator material level are aligned.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Agarwala et al. (US 2002/0182855 A1), Kim et al. (US 2003/0160333 A1), Lee et al. (US Patent 5589713), Takewaka et al. (US 2004/0188842 A1), Layadi et al. (US Patent 6821886 B1), Park et al. (US 2002/0109234 A1), Harada et al. (US Patent 6130481), Kim et al. (US 2002/0041030 A1), Ohto et al. (US 2004/0046261 A1).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


N. Drew Richards
AU 2815